Dietary diversity and nutritional status of adolescents in Lagos, Nigeria

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Abstract

Background/Objectives: Adolescents in low- and middle-income countries, such as Nigeria, are at increased risk of malnutrition, especially obesity, but there is limited data describing the risk. We assessed this risk by examining the nutritional status and associated factors such as dietary habits, dietary diversity, nutritional knowledge and sociodemographic characteristics among adolescents in Lagos, Nigeria. **Methods:** A descriptive cross-sectional study in which 682 adolescents were selected from their communities using a multistage sampling technique. Dietary habits were assessed using a food frequency questionnaire, and dietary diversity was assessed through nonquantifiable 24-h diet recall. Anthropometric measurements were taken to determine nutritional status. Data were analyzed using Epi-Info software version 7.2.3.1. Nutritional status was evaluated using WHO AnthroPlus software. Chi-square was used to test for an association between categorical variables, and *P* values ≤0.05 were considered statistically significant. **Results:** The mean age of the adolescents was 13.6 ± 2.3 years, and only 47.4% of them had good nutritional knowledge. Dietary habits were poor and dietary diversity was low. The prevalence of overweight and obesity was 13.4% and 7.0%. Eating dinner, dieting to control weight and daily consumption of foods outside the home were associated with overweight and obesity (*P* < 0.05). **Conclusions:** Dietary habits and diversity of the adolescents were poor, while overweight and obesity were high. Eating dinner and daily consumption of foods outside the home were factors associated with being overweight and obesity. Our findings emphasize the critical need for adolescent nutrition programs that address weight control, especially among those who eat outside their homes.

Keywords: Adolescent obesity, dietary diversity, dietary factors associated with obesity, dietary habits, nutritional status, obesity, overweight

Introduction

The coexistence of two different forms of malnutrition creates a double burden of nutrition-related ill health in specific populations. Adolescents in low-and middle-income countries are at increased risk of undernutrition (because of inadequate food intake, irregular meal consumption, especially breakfast skipping) and overnutrition resulting from overconsumption of foods that are high in calories and fats but poor in nutrients.[1-3]

Overweight and obesity continue to increase due to nutrition transition to energy and lipid-rich diets along with a decrease in physical activity, especially among urban adolescents.[3] Common eating behaviors include snacking, skipping meals, eating out and consuming foods that are high in fats and carbohydrates. Irregular meal patterns are associated with obesity and overeating is linked with breakfast skipping.[4-6]

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Globally, the percentage of overweight adolescents has more than tripled since 1980, with 17% of adolescents between ages 12 and 19 being considered overweight, while the prevalence of obesity (Body Mass Index (BMI) > 2SD BMI for age Z score) has risen from <1% in 1975 to >5% in girls and nearly 8% in boys age 5–19 in 2016.[7,8] Malnutrition increases health care costs, decreases productivity and slows economic growth, which can perpetuate a cycle of poverty and ill health.[8] Long-drawn undernutrition leads to energy and protein deficiency, which might result in an inhibition of physical and intellectual development, cognitive function impairment, disorders in the immune system and poor obstetrics outcomes.[9,10] It could also affect social and psychological development.[11] Moreover, being overweight increases the risk of noncommunicable diseases such as cardiovascular diseases, different kinds of disabilities and mortality later in life.[12-14]

Adolescence offers the last opportunity to intervene and recover growth that faltered in childhood and support a growth spurt. Adolescents have high nutritional needs but usually engage in risky habits such as unhealthy eating, which affect their immediate health and have a significant impact on their health in adulthood. About 40% of adult deaths in developing countries and 70–80% of deaths in industrialized countries are linked to attitudes and behaviors adopted during adolescence.[1] Research suggests that an adequate level of nutritional knowledge is related to optimal nutritional behaviors, while dietary habits affect nutritional status. Dietary habit is one of the modifiable risk factors for obesity in childhood and adolescence.[15,16] In Nigeria, the prevalence of overweight and obesity range from 7.4 to 13.2% and 2.6 to 4.4%, respectively.[17]

Over the years, the presumption that adolescents are less susceptible to disease and suffer relatively fewer life-threatening conditions has limited research interest in this group, while more attention has been given to children. Hence, there is a paucity of data on adolescent nutrition in Nigeria. Adolescents, however, constitute a significant population (almost one-fifth of Nigerian population) that represent a huge potential workforce whose health affects the nation socially and economically. Adolescents can learn and adopt healthy habits to create a strong foundation for healthy lifestyles to improve quality of their lives in adulthood. Some studies have reported poor dietary patterns and adolescents' malnutrition in other parts of Nigeria, but there is limited information about these parameters among adolescents in Lagos State.[16-18] Although Lagos, in terms of land mass, is the smallest State in Africa's most populous country, its cosmopolitan nature, economic productivity and high population density make it an effective window into the lived experiences of Sub-Saharan African populations, particularly in terms of how the nutritional status of adolescents predicts future health and healthcare burdens. This study was conducted to determine the nutritional status and the associated dietary factors among adolescents in Lagos, Nigeria. Information from the study would be useful to primary care physicians in counselling adolescents to improve their dietary diversity and nutritional status.

Methods

Study variables

A descriptive cross-sectional study was conducted among adolescents in Lagos, Nigeria. Adolescents between 10 and 19 years were included in the study. The minimum sample size determined using Cochran's formula (where *P* was 23.8% from the prevalence of malnutrition in a Nigerian study) was 400[19]; however, a higher sample of 682 was used.

A multistage sampling technique was used to determine the sample. Using simple random sampling technique, two local government areas (LGAs) (Somolu and Lagos Mainland) were selected from the 20 LGAs, four wards were selected from each LGA to obtain 8 wards and 3 streets were selected from the list of streets, in each ward to obtain 24 streets. All the eligible houses on each street were included in the study, but only one adolescent was selected from each household using the balloting method.

Data was collected using a structured interviewer-administered questionnaire. A standard questionnaire was adapted for the assessment of nutrition knowledge.[20] Some nonlocal foods in the standard questionnaire were replaced with local foods with similar nutrient profiles. A food frequency questionnaire was used to determine dietary habits. Dietary diversity was assessed through nonquantifiable 24-h diet recall. Anthropometric measurements were taken and analyzed according to WHO standard to determine the BMI.[21]

Six research assistants were trained successfully for data collection. The questionnaire was pretested in Oshodi-Isolo LGA, and the results were used to adjust the questionnaire before data collection.

Statistical analysis

Data was analyzed using EPI INFO epidemiological software package (version 7.2.3.1). The sociodemographic characteristics were analyzed using descriptive statistics. Relevant summary statistics were generated for the variables. The Chi-square test was used to determine the association between categorical variables, and *P*-values of ≤0.05 were considered statistically significant.

The scores of nutritional knowledge ranged from 0 to 15. The total knowledge score for each respondent was converted to percentage. Those who scored 60–100% had good knowledge, 40–59% had fair knowledge and 0–39% had poor knowledge.

The dietary habits were analyzed using frequency tables. Nonquantifiable 24-h dietary recall was analyzed based on the guidelines for analysis of Dietary Diversity by FAO. Participants who consume four out of the seven classes of food were classified as having adequate dietary diversity, while those who consumed below four classes of food were classified as having inadequate dietary diversity.[22]

Malnutrition was determined based on the WHO classification/BMI cut offs as follows. BMI Z scores were calculated for each adolescent based on their age in months, BMI and gender. Z score expresses the anthropometric value (BMI in this case) as a few standard deviations below or above the reference mean/median value and is classified as: < − 3SD – severe thinness (undernutrition); − 3SD to < − 2SD – thinness (undernutrition); − 2SD to +1 SD – normal weight; > +1SD to +2 SD = overweight; > +2SD – obese.[23]

Ethical approval

The study was conducted according to the guidelines laid down in the Declaration of Helsinki. Ethics approval was obtained from the Health Research and Ethics Committee of the Lagos University Teaching Hospital (Ref No: ADM/DCST/HREC/APP/3074) before commencing the study. Child assent was obtained from the participants, while informed written consent was obtained from their parents before the study. Confidentiality was assured and maintained throughout the period of the study.

Results

Sociodemographic characterisitcs

Most of the respondents were early adolescents (63.9%), females (55.6%) and lived with their parents (94.9%). The mean age of the participants was 13.6 ± 2.3 years. Only 47.4% (CIs 17.1–26.3%) had good overall nutritional knowledge. [Table 1].

Dietary habits and dietary diversity

Most of the adolescents ate 3–4 meals daily, but 21.1% of them skipped breakfast, 24.9% skipped lunch, while 19.9% skipped dinner daily. Most of them (82.0%) ate snacks and 47.7% drank carbonated soft drinks daily. Processed cereal including white rice was the commonest cereal consumed by adolescents daily (73.5%). Fruits and vegetables (F&V) (35.0%), roots and tubers (12.4%) and legumes (13.4%) were rarely eaten. Only 9.7% took an adequate amount of fruits and vegetables, which is 400 g or five servings per day. [Figure 1].

Only 17.2% had high dietary diversity. [Figure 2].

Nutritional status of the adolescents

Prevalence of underweight, overweight and obesity were 4.8, 13.4 and 7.0%, respectively. [Figure 3].

Factors associated with overweight and obesity

Overweight and obesity were not associated with age, sex or any other sociodemographic characteristics but were significantly associated with eating dinner, dieting to control weight and consuming food outside the home. Adolescents who ate dinner were 2.5 times more likely to be overweight/obese compared to the ones who skip dinner, while those who ate outside the home were 8.0 times more likely to be overweight/obese compared to others who do not eat outside. [Tables 2 and 3].

Table 1: Sociodemographics characteristics and level of nutrition knowledge of adolescents in Lagos, Nigeria		
Sociodemographic characteristics and nutrition knowledge	Frequency (*n*=682)	Percentage
Age in years		
10–14	436	63.9
15–19	246	36.1
Mean age: 13.6±2.3		
Sex		
Female	379	55.6
Male	303	44.4
Religion		
Christianity	453	66.4
Islam	229	33.6
Currently living with		
Parents	647	94.9
Other than parents	35	5.1
Family setting		
Monogamous	550	80.7
Polygamous	132	19.4
Ethnic group		
Yoruba	440	64.5
Igbo	168	24.6
Hausa	8	1.2
Others (Benin, Efik and so on)	66	9.7
Father's occupation		
Highly skilled	185	27.1
Business	294	43.1
Academics	54	7.9
Civil servant	111	16.3
Petty trading	38	5.6
Mother's occupation		
Housewife	22	3.2
Highly skilled	127	18.6
Business	241	35.3
Civil servant	158	23.2
Academics	24	3.5
Petty trading	110	16.1
Father's education level		
No formal education	83	12.2
Primary	44	6.5
Secondary	199	29.1
Tertiary	356	52.2
Mother's education level		
No formal education	95	13.9
Primary	52	7.6
Secondary	214	31.4
Tertiary	321	47.1
Overall level of knowledge		
Good	323	47.4
Fair	261	38.3
Poor	98	14.4
Total	682	100

Discussion

The majority (85.0%) of adolescents had 3–4 main meals per day even though 21.3% skipped breakfast and 19.9% skipped dinner daily. This could be because they lived with their parents who
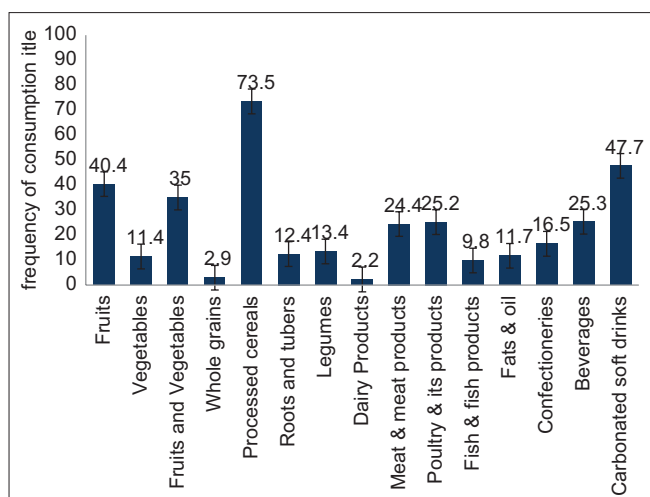
Figure 1: Daily consumption of foods from different food groups among adolescents in Lagos, Nigeria

Figure 2: Level of dietary diversity among adolescents in Lagos, Nigeria

monitor their feeding. This finding is corroborated by another report from urban Baroda, India, where 55% of the adolescents took regular meals three times a day.[5] However, in India, 55% of adolescents have a good habit of consuming three regular meals daily without skipping a single meal in a week.[5] Adolescents generally have poor habits of breakfast-skipping, irrespective of their geographical location. Some reasons for missing meals include little time for meal preparation, ill health, lack of appetite or disliking the food served.[24] Another reason for breakfast skipping, which may result in either undernutrition and obesity, is body image dissatisfaction.[6,16] About 45% of rural adolescents in India suffer from undernutrition with BMI less than 2SD.[25]

Daily consumption of snacks (82.0%) and carbonated drinks (52.3%) was high among adolescents. These findings are similar to reports from Sokoto where 82.1% of the students consumed snacks daily and Ghana where the majority of adolescents were reported to have sweet tooth patterns, which are associated with the consumption of pastry snacks and carbonated soft drinks.[24,26] Adolescents commonly indulge in unhealthy dietary practices. When adolescents skip meals, they often make poor decisions, such as consuming less F&V, buying fast foods or unhealthy snacks, which in turn leads to weight gain and, ultimately, diabetes and heart disease later in life.[4] The reason for the increased consumption of snacks can be parents' improved income and availability of unhealthy foods. The adolescents have some amount of money for daily spending, and since these unhealthy snacks and soft drinks are relatively affordable and available, they purchase them with ease. The WHO survey among adolescents in Oman, Asia also reported that foods that were consumed as snacks included carbonated drinks (33.4%) and fast foods (10%), which were mostly obtained outside the home. Traditional diets (predominantly cereal and tuber based, fresh F&V and foods low in fat) are now giving way to diets which are high in calorie, lack diversity due to westernization, especially among those who spend long hours outside home.[27]
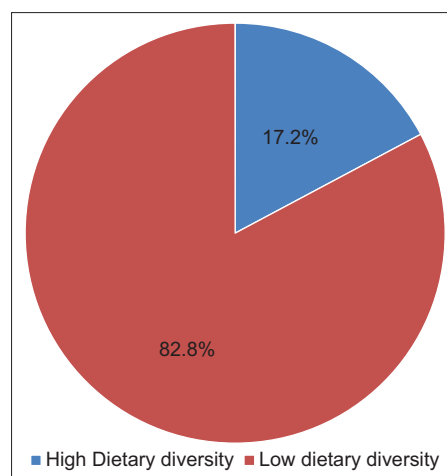
The choice of fast food among adolescents is influenced by taste, convenience and cost. Most fast foods with the qualities of good taste, convenience and low cost, have a high fat, salt and sugar but low fiber content which promotes obesity. Carbonated soft drinks are energy dense and have a high glycemic index. Some studies have linked high soft drink consumption rate to poor intake of calcium, vitamin C and increased risk of bone fractures because of its acidity.[27]

Cereals, especially rice (73.5%) and pastries (69.6%), were the most commonly consumed food group. This finding correlates with other studies from South-western Nigeria (76.5%), Ethiopia (97.6%) and India (50%), where rice and pastries were commonly consumed by adolescents compared with other foods.[5,28,29]

Refined cereals like processed rice and pastries have little or no fiber and contribute to the prevalence of obesity. They contribute significantly to the higher intakes of advanced glycation end-products (AGEs), which is associated with marginally greater weight gain. The top six food groups contributing to AGEs intake are cereals/cereal products, meat/processed meat, cakes/biscuits, dairy, sugar and confectionary and fish/shellfish.[30]

The prevalence of overweight (13.4%) and obesity (7.0%) among Lagos adolescents obtained in this current study is higher than the rate in other parts of Nigeria such as Ondo (0.96%) and Port Harcourt (1.8%).[17,31] The burden of overweight and obesity in Lagos is, however, less than obtained in developed countries such as Brazil, where adolescent overweight and obesity are 32.3 and 12.9%, respectively. Our study confirms the increasing global trend of obesity. The nutritional status of adolescents is very important because it has a significant impact on their health and reproduction in the future.

In this study, age and sex were not associated with the prevalence of overweight/obesity. This disagrees with other reports where early adolescence was a predictor of obesity.
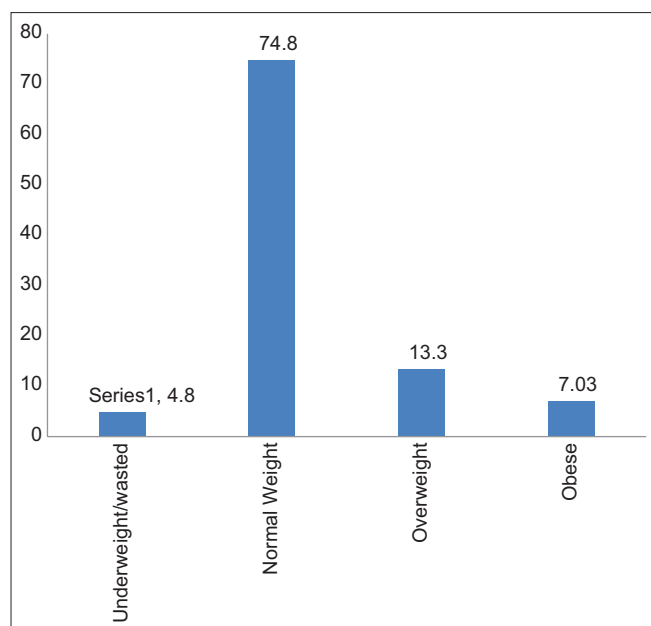
Figure 3: Nutritional status of adolescents in Lagos, Nigeria

The lower rate of obesity among late adolescents may be because they are more conscious of their body image and body weight.[32,33] Similar studies from the Northern part of Nigeria and Ethiopia reported a higher prevalence of overweight and obesity among females.[24,28] The explanation for obtaining higher prevalence among females are developmental changes and hormonal influences at the beginning of menarche in females. In addition to the hormonal influences, boys participate more in physical activities, which necessitate more energy utilization compared with girls, thereby reducing the risk of fat accumulation.[7,34]

The overall nutritional knowledge was fair since almost half of the adolescents had a good nutrition knowledge. This is in contrast to a study in another part of Nigeria where only 19% of the adolescents had good level of nutritional knowledge.[24] Nigerian adolescents do not have substantial nutritional knowledge to make healthy choices to support normal nutritional status. On the contrary, a Tehranian study reported good nutritional knowledge among most of their adolescents.[35] This could be because adolescents in Asia are more exposed than those in Nigeria. Although this study did not demonstrate any association between level of knowledge and nutritional status, good nutritional knowledge has been shown to have a positive influence on healthy food choices and health.[36,37]

Only 9.7% of the adolescents consumed an adequate amount of five servings (400 g) of F&V daily, although 35% ate fruits and vegetables daily. This is lower than the prevalence of adequate consumption of F&V among adults in Lagos (27.0%).[38] Consumption of F&V is usually lower among adolescents due to inadequate knowledge about their benefits, family practice of inadequate F&V intake, dislike of the taste of some fruits and others. Inadequate intake of F&V was positively associated

with a higher prevalence of obesity, but the difference was not statistically significant. This correlates with the report from a similar study in Benin City, where low consumption of F&V was associated with overweight.[16]

Only 17.2% of the respondents had high dietary diversity, similar to the report among Zimbabwe and Tehranian adolescents, where less than 50% of adolescents had high dietary diversity.[39] Based on the guidelines by FAO for determining Dietary Diversity Score, dietary diversity is regarded as high and more likely to meet micronutrient needs if four or more food groups are consumed out of the seven food groups per day, whereas dietary diversity is poor if three or less food groups are consumed per day. High-dietary diversity indicates significantly higher intakes of most key nutrients and availability for the body to maintain a normal nutritional status.[5] In this study, dietary diversity was not associated with nutritional status though some other studies have demonstrated an association.[39-42]

Eating dinner was a predictor of overweight and obesity. Those who ate dinner were 2.5 times at risk of obesity compared to others who did not. The problem with eating dinner is when dinners are heavy or eaten late. This study agrees with the report of a study in Israel, which showed that reduced intake at dinner is beneficial and might be a useful alternative for the management of obesity and metabolic syndrome.[43] Other studies have demonstrated that having a late dinner is associated with increased risks of obesity.[44,45] Although another study suggested that skipping dinner increases BMI, looking at the mechanisms of weight gain in those skipping dinner; they are more likely to be associated with late evening snacking with poor quality food/drinks as well as increased likelihood of ingestion of calorie-dense foods the next day. These attributes are more likely to be seen in resource-rich environments than they are in adolescent populations in low and middle income countries (LMIC)s. It is not surprising that skipping dinner would be associated with lower BMI when there is no recourse to compensatory behaviors involving late snacking with poor quality snacks or ingestion of calorie-dense foods the next day.[46]

A significant number (28.9%) of the adolescents were involved in dieting to control weight, and this was associated with a higher prevalence of obesity and overweight/obesity compared with those who did not practice strict dieting. This agrees with other studies which demonstrated a higher risk of overweight/obesity among dieters.[47,48] Many of the adolescents (24.5%) ate outside their homes daily, and this was significantly associated with a higher prevalence of obesity compared with those who did not eat outside their homes every day. This agrees with other studies which have shown frequent eating outside the home as a bad eating habit accompanied by a risk for overweight and obesity. The problem with food obtained from restaurants is that they are usually high in fat and sodium, which increase the risk of noncommunicable diseases.[49,50]

Table 2: Factors associated with the nutritional status of the adolescents							
	Under-weight/wasted	Normal weight	Over-weight	Obese	Total	X^2	*P*
Sex							
Female	23 (6.1)	276 (72.8)	54 (14.2)	26 (69)	379 (100)	3.666	0.3
Male	10 (3.3)	234 (77.2)	37 (12.2)	22 (7.3)	303 (100)		
Age group							
10–14	16 (3.7)	333 (76.4)	50 (11.5)	37 (8.5)	436 (100)		
15–19	17 (6.9)	176 (71.8)	41 (16.7)	11 (4.5)	245 (100)	10.7	0.013
Level of knowledge							
Good	10 (3.1)	247 (76.5)	45 (13.9)	21 (6.5)	323 (100)		
Fair	19 (7.3)	185 (70.9)	37 (14.2)	20 (7.7)	261 (100)	8.084	0.232
Poor	4 (4.1)	78 (79.6)	9 (9.2)	7 (7.1)	98 (100)		
Daily consumption of fruits and vegetable							
Yes	11 (4.6)	183 (76.6)	32 (13.4)	13 (5.4)	239 (100)		
No	22 (5.0)	327 (73.8)	59 (13.3)	35 (7.9)	443 (100)	1.537	0.674
Categories of main meals eaten							
<3	3 (4.6)	46 (70.8)	10 (15.4)	6 (9.2)	65 (100)		
3–4	29 (5)	432 (74.6)	78 (13.5)	40 (6.9)	579 (100)	2.701	0.845
>4	1 (2.6)	32 (84.2)	3 (7.9)	2 (5.3)	38 (100)		
Daily consumption of soft drinks							
Yes	14 (4.3)	245 (75.4)	39 (12)	27 (8.3)	325 (100)		
No	19 (5.3)	265 (74.2)	52 (14.6)	21 (5.9)	357 (100)	2.653	0.448
Skip breakfast everyday							
Yes	8 (5.6)	109 (75.7)	16 (11.1)	11 (7.6)	144 (100)		
No	25 (4.6)	401 (74.5)	75 (13.9)	37 (6.9)	538 (100)	0.989	0.804
Skip lunch everyday							
Yes	12 (7.1)	127 (74.7)	19 (11.2)	12 (7.1)	170 (100)		
No	21 (4.1)	383 (74.8)	72 (14.1)	36 (7)	512 (100)	3.104	0.376
Skip dinner everyday							
Yes	13 (9.6)	109 (80.1)	10 (7.4)	4 (2.9)	136 (100)		
No	20 (3.7)	401 (73.4)	81 (14.8)	44 (8.1)	546 (100)	17.1	0.001
Dietary diversity							
High	10 (8.5)	85 (72.6)	12 (10.3)	10 (8.5)	117 (100)		
Low	23 (4.1)	425 (75.2)	79 (14)	38 (6.7)	565 (100)	5.565	0.135
Dieting to control weight							
Yes	32 (16.2)	123 (62.4)	24 (12.2)	18 (9.1)	197 (100)	82.13	<0.001
No	1 (0.2)	387 (79.8)	67 (13.8)	30 (6.2)	485 (100)		
Money available for daily spending							
No pocket money	3 (5.8)	42 (80.8)	5 (9.6)	2 (3.8)	52 (100)		
Not consistent	5 (5.3)	76 (80.0)	10 (10.5)	4 (4.2)	95 (100)	15.24	0.229
N20–N100	17 (6.5)	185 (70.6)	44 (16.8)	16 (6.1)	262 (100)		
N101–N300	4 (3.6)	86 (76.8)	14 (12.5)	8 (7.1)	112 (100)		
Above N300	4 (2.5)	121 (75.2)	18 (11.2)	18 (11.2)	161 (100)		
Daily consumption of outside food							
Yes	12 (2.3%)	371 (72.0%)	86 (16.7%)	46 (8.9%)	515 (100)		
No	21 (12.6%)	139 (83.2%)	5 (3%)	2 (1.2%)	167 (100)	57.937	0.000
Total	33 (4.8)	510 (74.8)	91 (13.4)	48 (7.0)	682 (100)		

Limitations

A cross-sectional study used for this study would only allow a measure of association between nutritional status and the related factors. Ideally, to have strengthened inferences of causality, a longitudinal study design would have been preferable.

Recommendation for further studies

Adolescent nutrition intervention programs addressing healthy diet and weight control are needed in Lagos.

Conclusion and Global Health Implications

Prevalence of overweight and obesity was high among adolescents in Lagos, Nigeria though less than in developed countries. Eating dinner and daily consumption of foods outside the home were factors associated with being overweight and obesity. The findings of our study emphasize the critical need for adolescent nutrition programs that address weight control, especially among those who eat outside their homes.

Table 3: Determinants of overweight and obesity among adolescents in Lagos, Nigeria

	Adjusted Odd ratio	95% C.I. for AOR		P
		Lower	Upper	
Age group				
10–14	1 (Ref)			
15–19	0.993	0.659	1.498	0.974
Sex				
Female	1 (Ref)	0.700	1.554	0.837
Male	1.043			
Strict dieting to control weight				
No	1 (Ref)			
Yes	1.142	0.74	1.764	0.548
Skip dinner				
No	1 (Ref)			
Yes	2.498	1.35	4.624	0.004
Money for daily spending				
None and not consistent	0.906	0.335	2.455	0.847
N20–N100	1.807	0.941	3.473	0.760
N101–N300	1.513	0.713	3.211	0.281
Above N300	1.789	0.891	3.589	0.102
Consumption of outside food				
No	1 (Ref)			
Yes	7.990	3.631	17.583	0.000
Constant	0.023			0.000

Conflicts of interest

There are no conflicts of interest.

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